

**Effects of dormant vs. growing season burns on small mammal captures  
at Cooper Farm in Muncie, Indiana**

An Honors Thesis (HONRS 499)

By

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# **Effects of dormant vs. growing season burns on small mammal captures at Cooper Farm in Muncie, Indiana**

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## **Abstract**

Prescribed burning is an important method for maintaining tall-grass prairies. Done in the growing season (late summer) or the dormant season (late fall or early spring), burning alters nutrient cycling and clears dead plant material from the prairie. Due to the different plant types promoted by each burn type, growing and dormant season burns have different effects on small mammal species composition. This objective of this study was to determine differences in small mammal captures in prairie plots subjected to growing season burns and prairie plots subjected to dormant season burns. Small mammals were captured at Cooper Farm from September 2<sup>nd</sup> until November 6<sup>th</sup>, 2014 in 10 three-day trapping sessions with a total of 2,000 trap nights. Fifty Sherman traps were set in grid formations in two systematically selected prairie plots per trapping session. A two-sample t-test revealed that there was no difference in number of captures between growing and dormant season burn plots. This is the beginning of a long-term study; future studies may better see the long-term effects of the burns. The long-term effects of the burns may change number of captures, better reflecting importance of burn type on small mammal communities. Also any changes in study design that would increase trap success, such as lengthening the trapping season and number of trap nights would improve the accuracy of the results and better reflect the effects of burn type on small mammals.

## **Acknowledgements**

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## Introduction

Prescribed burning is an important management tool for tall-grass prairies and the small mammals that inhabit them (Kirchner et al. 2011). Burning promotes growth of native forbs and grasses by altering nutrient cycling and clearing dead plant material from the prairie, and it inhibits growth of invasive and woody plants that will disrupt the prairie community (Kirchner et al. 2011). Burning prevents succession to a woodland; without it, woody seedlings and saplings will dominate the prairie over time until it becomes a forest, which can happen in less than twenty years (Howe 1994). Burning can extend the length of the growing season and increases the rate of photosynthesis during the growing season by allowing more light penetration to the soil surface (Copeland et al. 2002).

Burning affects small mammal communities by changing quantity and timing of food, vegetative cover, and availability of nest sites (Kirchner et al. 2011). These altered food and habitat characteristics are due to reduction in dead plant material, increase in native plant yield, and seed dispersal (Beck and Vogl 1972). Kirchner et al. (2011) reported that burning creates favorable conditions for *Peromyscus spp.*, and other granivorous rodent species because it creates an abundant food supply.

The two types of prescribed burns used for management are growing season and dormant season burns. The different burn types promote different plant types because they affect plants at different developmental stages (Copeland et al. 2002). Growing season burns, done in late summer, promote plant diversity, especially in the herbaceous plants and inhibit hardwood plants, while dormant season burns, done in late fall or early spring, promote strong, dense grasses and reduce general plant diversity (Kirchner et al.

2011). Dormant season burns damage forbs as they initiate growth, inhibiting growth throughout the rest of the season (Copeland et al. 2002). Forbs grow with reduced vigor but grasses recover quickly from the dormant season burns due to their stored energy supply underground (Copeland et al. 2002). Growing season burns damage grasses while they are at peak growth and reproduction, which strongly suppresses their growth during the following year because of the fire damage during the active growing period and reduction in energy storage for the winter (Copeland et al. 2002). Thus, growing season burns promote forbs by reducing competition from grasses, reducing shade cover, allowing early sprouting of seeds, and increasing sunlight for maximum growth (Copeland et al. 2002). Growing season burns create greater plant diversity as well as a greater structural diversity due to the combination of annual herbaceous plants and perennial grasses.

The thick plant growth encouraged by dormant season burns can provide ideal habitat for small mammals, though the lack of bare ground space for traveling and foraging could inhibit this success. However, the less diverse plant community may limit food during some portions of the year. After growing season burns, the increased amount of bare ground space is ideal for traveling and foraging; however, there may be a decreased amount of cover available that could be disadvantageous for nesting (Kirchner et al. 2011). However the incomplete burn pattern of growing season burns that tends to leave patches of thicker unburned habitat may provide a better balance between bare ground space and amount of cover. In a study done in 2013 at Cooper Farm that occurred a few weeks after burning was conducted, more small mammals were captured in the plots subjected to dormant season burns than the plots subjected to growing season burns.

However, since trapping occurred so soon after the burn, the small mammals may not have had the chance to return to previous activity levels (Bailey 2014). In a study done by Preismeyer et al. (2014), a higher amount of precipitation before the dormant season burn caused more small mammals to be captured in the prairie when subjected to dormant season burns rather than growing season burns. Kirchner et al. (2011) reported that capture rates were lower in growing season burn plots because of lack of sufficient cover for small mammals.

### *Objective*

The purpose of this study is to determine the difference in number of small mammal captures between plots subjected to dormant season burns and plots subjected to growing season burns.

### **Methods**

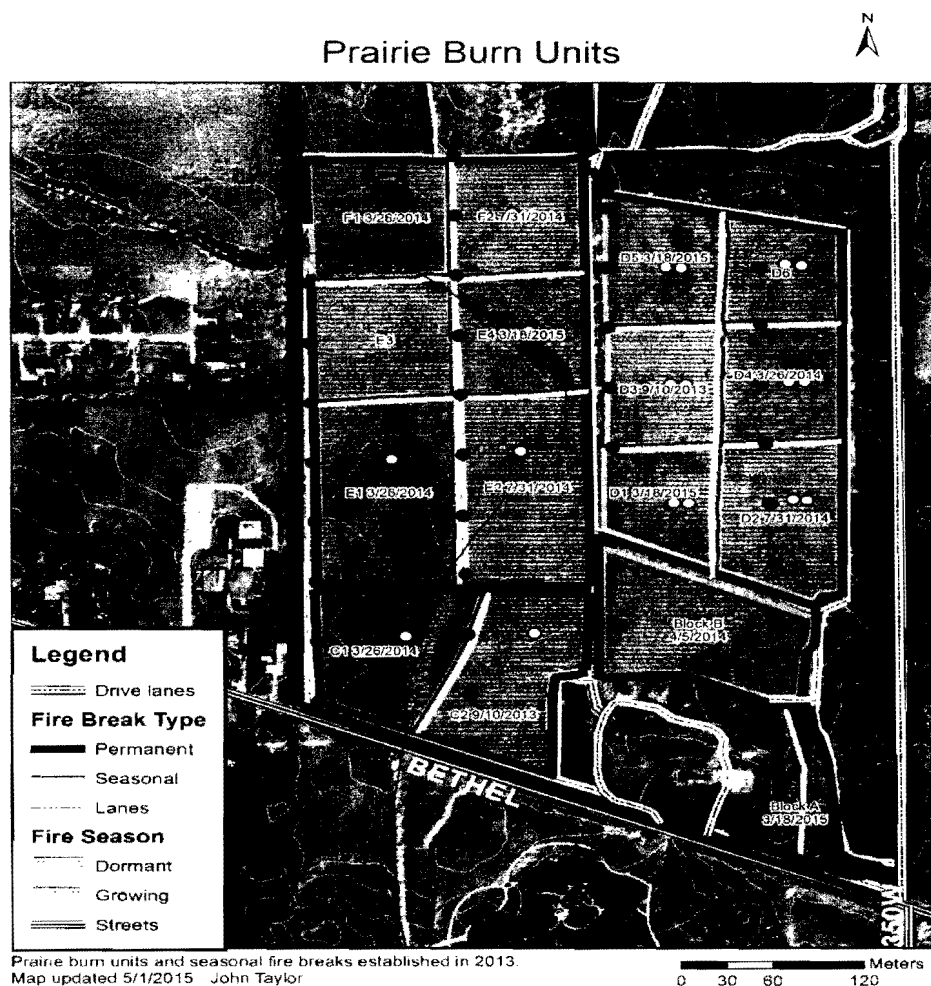
#### *Study Site*

This study took place at Cooper Farm, which is a Ball State University property located in Muncie, Indiana. It is made up of 32 acres of woodland and 57 acres of tall-grass prairie. Trapping occurred on the prairie, which is divided into fourteen 100 meters by 100 meters square plots separated by mowed firebreaks.

#### *Burning*

The prairie plots have been subjected to prescribed burns since 2004 for management purposes. From 2004 until 2013, the plots were on a rotating dormant season burn schedule with approximately 50% of the prairie burned each year. Beginning in 2013, plots are now burned during either the growing or dormant season. Three to four

plots are burned during each growing season (July-August) and each dormant season (March; Figure 1).



**Figure 1.** Prairie burn plots at Cooper Farm in Muncie, IN labeled by name and date of last burn. Plots shaded in brown were last subjected to dormant season burns and plots shaded in green were last subjected to growing season burns.



### *Trapping*

The trapping season began on September 2<sup>nd</sup> 2014, ended on November 6<sup>th</sup> 2014, and consisted of ten trapping sessions. Each session lasted for three days (two trap nights); traps were set the first evening, checked the next morning, and then checked and collected the final morning. Prior to the trapping season, one growing season plot and one dormant season plot were systematically selected from the 14 for each trapping session. Fifty Sherman live traps (8 x 9 x 23 cm) were baited with sunflower seeds, insulated with small pieces of cotton, and placed in a grid pattern in each plot. Two traps were placed at the center of the grid, which was made up of seven north-south columns and seven east-west columns each ten meters apart.

### *Animal Handling*

Upon capture, the species and sex of the small mammal were recorded. A fur snip was made on the dorsal side of the animal to mark it for recapture identification.

### *Data Analysis*

Two-sample t-tests were performed to determine the differences in average number of captures per plot subjected to growing season burns versus plots subjected to dormant season burns. These tests were used to determine differences in number of captures of all small mammals captured, *Peromyscus spp.* only, and *Microtus pennsylvanicus* only, in order to investigate effects of burn type on different species.

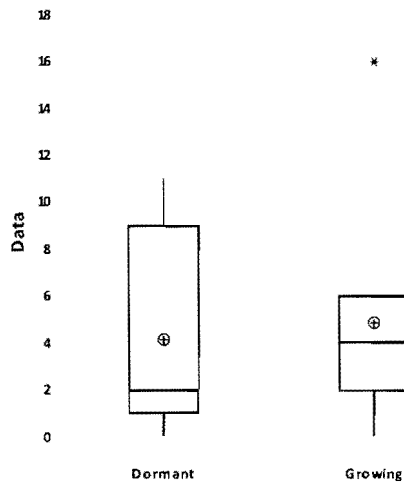
## **Results**

In 2,000 trap nights, 94 small mammals were captured (Table 1); 48 captures were in growing season burn plots and 46 were in dormant season burn plots. The majority of captures were *Peromyscus spp.* (Table 1).

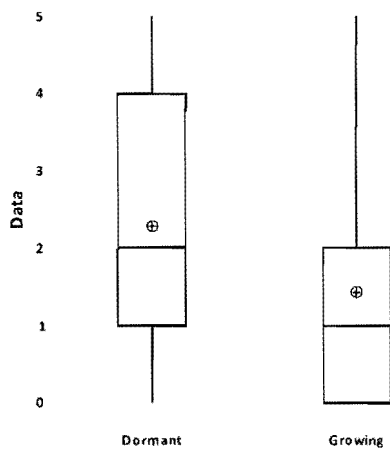
**Table 1.** Total numbers of small mammals captured in growing season burn plots and dormant season burn plots at Cooper Farm in Muncie, IN from September 2<sup>nd</sup>, to November 6<sup>th</sup>, 2014.

	<i>Peromyscus</i> <i>spp.</i>	<i>Microtus</i> <i>pennsylvanicus</i>	<i>Blarina</i> <i>brevicauda</i>	<i>Zapus</i> <i>hudsonius</i>
<b>Growing</b>	34	10	3	1
<b>Dormant</b>	29	16	1	0
<b>Totals</b>	63	26	4	1

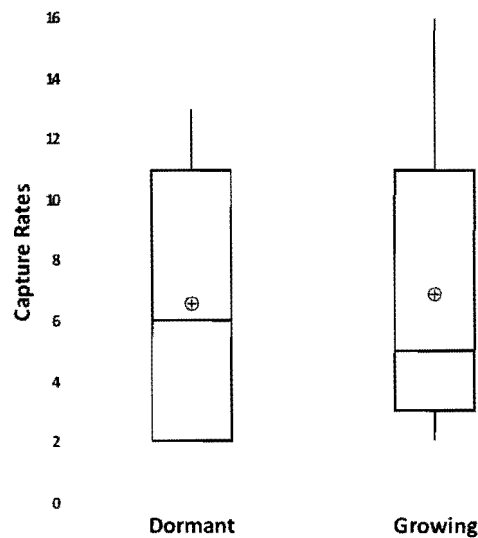
When comparing number of small mammal captures between plots subjected to growing season burns and dormant season burns, the mean number of captures for *Peromyscus spp.* in growing season burns was  $4.86 \pm 2.0$  captures per plot. The mean total number of captures for *Peromyscus spp.* in dormant season burns was  $4.14 \pm 1.6$  captures per plot. There was no significant difference between number of captures of *Peromyscus spp.* for the two burn types ( $p = 0.784$ ; Figure 2). The mean number of captures for meadow voles (*Microtus pennsylvanicus*) in growing season burns was  $1.43 \pm 0.69$  captures per plot. The mean number of captures for meadow voles in dormant season burns was  $2.29 \pm 0.64$ . There was no significant difference between mean number of captures of meadow voles for the two burn types ( $p = 0.380$ ; Figure 3). The mean total number of captures for growing season burns was  $6.86 \pm 1.9$  total captures per plot. The mean total number of captures for dormant season burns was  $6.57 \pm 1.6$  total captures per plot. There was no significant difference between mean total number of captures of the two burn types ( $p = 0.91$ ; Figure 4)



**Figure 2.** Total number of captures of *Peromyscus* spp. in growing season and dormant season burn plots at Cooper Farm in Muncie, IN from September 2<sup>nd</sup>, to November 6<sup>th</sup>, 2014.



**Figure 3.** Total number of captures of meadow voles (*Microtus pennsylvanicus*) in growing and dormant season burn plots at Cooper Farm in Muncie, IN from September 2<sup>nd</sup>, to November 6<sup>th</sup>, 2014.



**Figure 4.** Total number of small mammal captures in growing season and dormant season burn plots at Cooper Farm in Muncie, IN from September 2<sup>nd</sup>, to November 6<sup>th</sup>, 2014.

## Discussion

### *Effects of dormant vs. growing season burns on capture rates*

The results of this study do not support the hypothesis that more small mammals would be captured in dormant season burn plots. The results show that prescribed burn type has no effect on total number of small mammal captures at Cooper Farm, and burn type does not affect number of captures of any particular species. This conclusion contradicts results of past studies at Cooper Farm and in other tall-grass prairies (Bailey 2014; Priesmeyer et al. 2014).

A potential reason why the results contradicted previous studies could be study design. A longer trapping season and increased number of trap nights would increase the

amount of data collected and increase the precision of the averages of the number of captures, reflecting a more accurate picture of the differing effects of burn type. Any improvements to the study that increases trapping success, such as bait type, activity level of small mammals, and weather will reflect a more accurate picture of the differing effects of burn type.

### *Future Management Implications*

Although this study concluded that burn type does not effect number of captures of small mammals, further investigations on this topic will be beneficial since this study had a short duration and relatively small dataset. This study is the beginning of a long-term study of effects of growing and dormant season burns on small mammals at Cooper Farm. Because of this, future studies may better be able to see the long-term effects of the burns. This could also potentially change number of captures and provide more insight into whether or not burn type is important when managing for small mammals at Cooper Farm.

Despite uncertainty of importance of burn type, we can conclude that burning itself is important for managing small mammals and a burning cycle should be continued at Cooper Farm. Burning releases seeds from vegetation, which provides an abundant food supply for granivorous species such as *Peromyscus spp.*, which seem to be the dominant small mammal species at Cooper Farm. Burning also changes quantity of cover and availability of nest sites by altering plant composition.

Future topics for research could include studying the effects of prescribed burn types on species composition and habitat composition. Another topic for future research is the effects of burn coverage on number of captures. Burning does not always

completely consume all of the vegetation within a plot. Many plants such as grasses have leaf sheaths and meristems at their leaf bases, which provide protection from heat and fire, allowing them to resist aboveground fire damage (Ewing and Engle 1988). During the growing season, plants may not burn as well as in the dormant season because they are still in peak growth. Since burning does not always completely consume all of the vegetation within a plot, the prairie will have an uneven coverage of plants, which in turn alters small mammal habitat and food availability. The differences between burned and unburned sections of the prairie could affect number of small mammal captures based on the altered habitat and food availability.

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